

Claims

What is claimed is:

1. A method of treating a pathogen within an oral cavity, the method comprising:
  - a. locating one or more pathogens within the oral cavity; and
  - b. irradiating target tissue within the oral cavity with pulsed laser light having an energy of 10 Joules/cm<sup>2</sup> or greater per pulse.
2. The method of claim 1, wherein the pulsed laser light comprises a wavelength in a range of 580 to 1800 nanometers.
3. The method of claim 1, wherein the target tissue is selected from the group consisting of hard periodontal tissue and soft periodontal tissue.
4. The method of claim 2, wherein the target tissue corresponds to a volume of soft periodontal tissue.
5. The method of claim 4, wherein the soft tissue corresponds to soft periodontal tissue is within a periodontal pocket.

- 1 6. The method of claim 1, wherein the target tissue is irradiated with the pulsed laser light  
2 through an optical fiber.
- 1 7. The method of claim 6, wherein the optical fiber is placed within a periodontal pocket.
- 1 8. The method of claim 6, wherein the optical fiber has a fiber diameter in a range of 0.05 to  
2 3.0 mm
- 1 9. The method of claim 1, wherein the target tissue is irradiated with a fluence of the pulsed  
2 laser light that is 350 Joule/cm<sup>2</sup> or greater.
- 1 10. The method of claim 1, wherein the area of target tissue is irradiated with 2 Joules of  
2 more of pulsed laser light.
- 1 11. The method of claim 1, wherein the area of target tissue is irradiated with the pulsed laser  
2 light for less than 1.0 second.
- 1 12. The method of claim 3, further comprising debridement of the target tissue prior to the  
2 step of irradiating target tissue.

- 1 13. The method of claim 1, wherein the one or more pathogens include a pigmented gram (-)  
2 anaerobe.
- 1 14. The method of claim 1, wherein the pigmented gram (-) anaerobe is selected from the  
2 group consisting of porphyromonas gingivalis (*Pg*) and prevotella intermedia (*Pi*).
- 1 15. The method of claim 1, wherein one or more pathogens includes a pigmented fungus.
- 1 16. The method of claim 15, wherein the pigmented fungus is a fungus selected from the  
2 group consisting of Histoplasma and Aspergillus Niger.
- 1 17. The method of claim 1, further comprising staining the bacteria.
- 1 18. The method of claim 1, wherein a substantial portion of the pathogen is eradicated.
- 1 19. The method of claim 18, further comprising testing for the presence of a portion of  
2 pathogens.
- 1 20. A method of treating a periodontal pocket comprising:  
2 a. generating a sequence of laser pulses at an absorption wavelength; and

3           b.       directing the laser pulses to the periodontal tissue such that at least a portion of  
4                   bacteria within the periodontal tissue is eradicated.

1       21.     The method of claim 20, wherein the periodontal tissue is selected from the group  
2                   containing of dentin, cementum, bone and gum tissue.

4       22.     The method of claim 20, wherein the laser pulses are directed to the periodontal tissue is  
5                   within a periodontal pocket and wherein the laser pulses penetrate through soft tissue  
6                   surrounding the periodontal pocket.

7       23.     The method of claim 22, wherein the laser pulses penetrate the surrounding soft  
8                   periodontal pocket by a distance of 1.0 mm or more.

9       24.     The method of claim 20, wherein the laser pulses are generated with a Nd:YAG laser.

1       25.     The method of claim 20, wherein the laser pulses have energy concentrations of 17  
2                   Joules/cm<sup>2</sup> per pulse or greater.

1       26.     The method of claim 20, wherein the laser pulses are directed to the periodontal tissue  
2                   from an optical fiber.

- 3 27. The method of claim 26, wherein the optical fiber has a fiber diameter in a range of 0.5 to  
4 3.0 mm.
- 1 28. The method of claim 20, wherein the bacteria is a pigmented gram (-) anaerobe.
- 1 29. The method of claim 20, wherein the pigmented gram (-) anaerobe is selected from the  
2 group consisting of *porphyromonas gingivalis* (*Pg*) and *prevotella intermedia* (*Pi*) and a  
3 pigment fungi.
- 4 30. The method of claim 20, wherein directing the laser pulses to the periodontal tissue also  
5 eradicates a portion of a pigmented fungus within the periodontal tissue.
- 6 31. The method of claim 30, wherein the pigmented fungus is a fungus selected from the  
7 group consisting of *Histoplasma* and *Aspergillus Niger*.
- 8 32. The method of claim 20, further comprising applying a staining agent within the  
9 periodontal pocket, wherein the staining agent stains for the presence of living bacteria.
- 1 33. A system for eradicating a bacteria colonized within a soft tissue, the system comprising:  
2 a. a pulsed laser source for generating pulsed laser light with a wavelength in a range

3 of 580 to 1800 nanometers; and

- 4 b. an applicator configured for delivering the pulsed laser light to a wide field  
5 exposure area of soft tissue with sufficient laser energy to penetrate the soft tissue  
6 and eradicate the bacteria therein.

1 34. The system of claim 33, wherein the applicator is configured to deliver the pulsed laser  
2 light within an oral cavity.

35. The system of claim 33, wherein the pulsed laser source is Nd:YAG laser source.

36. The system of claim 33, wherein the wide field exposure area corresponds to an area of  
of 1.0 to 9 mm<sup>2</sup>.

37. The system of claim 33, wherein the applicator comprises a lens for focusing the pulsed  
2 laser light to the wide field exposure area.

1 38. The system of claim 33, wherein the applicator comprises an optical fiber with a firing  
2 end configured to emit the pulsed laser light.

1 39. The system of claim 38, wherein the firing end of the optical fiber is configured to emit

2 the pulsed laser light at an angle from the firing end.

1 40. The system of claim 33, wherein the applicator further comprises scanning means for  
2 scanning the pulsed laser light over the wide field exposure area.

1 41. The system of claim 38, wherein the applicator comprises a guide member for limiting  
2 the firing end optical fiber to distances from wide field exposure area.

1 42. The system of claim 41, wherein the guide member is formed from a material selected  
2 from the group consisting of silicon, latex, polyurethane, and rubber.